14076426

CHI MEI
OPTOELECTRONICS CORP.

Approval

TFT LCD Approval Specification

MODEL NO.: N154I2-L02

Customer : Fujitsu

Approved by :

Note :

記錄	工作	審核	角色	投票
2007-06-21 16:10:39 CST	Approve by Dept. Mgr.(QA RA)	yuan_chan(趙俊淵 /52760/54760)	Department Manager(QA RA)	Accept
2007-06-15 11:01:16 CST	Approve by Director	jy_wu(吳震乙/56360/54952)	Director	Accept
2007-06-06 17:16:54 CST	Approve by Director	kf_huang(黃崑峰 /56620/54380/14906/25075)	Director	Accept
2007-06-06 14:11:07 CST	Approve by Director	wy_li(李汪洋/44701)	Director	Accept

Version 3.0

Doc No.:
Issued Date: Jun. 04, 2007
Model No.: N154I2-L02 (NF4I202908)

Approval

- CONTENTS -

Version 3.0

14076426

Doc No.:
Issued Date: Jun. 04, 2007
Model No.: N154I2-L02 (NF4I202908)

Approval

REVISION HISTORY

Version	Date	Page (New)	Section	Description
Ver 0.0	Nov.11, 2005	All	All	Tentative specification first issued.
Ver 0.1	Jan, 03 2006	4	1.5	Weight reduce from 600g to 540g
		6	2.2.2	Lamp current: Typ./6.0mA, Max./6.5mA
		7	3.1	Power Supply Current reduce
		9	3.2	BACKLIGHT UNIT Lamp Current: Typ./6.0mA, Max./6.5mA
		19	7.2	OPTICAL SPCIFICATION, Luminance definition revise
Ver 2.0	Feb.14, 2006	9	3.2	Backlight Unit
		14	5.5	EDID Data
		20	7.2	Optical Specifications
		27	10.2	Carton label
Ver 3.0	Jun.04,2007	10	3.2	Lamp Turn On Voltage
		13	5.1	Add mounting inclination of a connector carries out drawing
		23	7.2	Average Luminance of White spec.
		23	7.2	Color Chromaticity of RGB

Version 3.0

14076426

Doc No.:
Issued Date: Jun. 04, 2007
Model No.: N154I2-L02 (NF4I202908)

Approval

1. GENERAL DESCRIPTION

1.1 OVERVIEW

N154I2-L02 is a 15.4" TFT Liquid Crystal Display module with single CCFL Backlight unit and 30 pins LVDS interface. This module supports 1280 x 800 Wide-XGA mode and can display 262,144 colors. The optimum viewing angle is at 6 o'clock direction. The inverter module for Backlight is not built in.

1.2 FEATURES

- Thin and light weight

- WXGA (1280 x 800 pixels) resolution

- 3.3V LVDS (Low Voltage Differential Signaling) interface with 1 pixel/clock

1.3 APPLICATION

- TFT LCD Notebook

1.4 GENERAL SPECIFICATI0NS

Item	Specification	Unit	Note
Active Area	331.2 (H) x 207.0 (V)　(15.4" diagonal)	mm	(1)
Bezel Opening Area	335.0 (H) x 210.7 (V)	mm	
Driver Element	a-si TFT active matrix	-	-
Pixel Number	1280 x R.G.B. x 800	pixel	-
Pixel Pitch	0.2588 (H) x 0.2588 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	262,144	color	-
Transmissive Mode	Normally white	-	-
Surface Treatment	Hard coating (3H), Glare	-	-

1.5 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)	343.5	344.0	344.5	mm	(1)
	Vertical(V)	221.5	222.0	222.5	mm	
	Depth(D)	-	6.2	6.5	mm	
Weight		-	540	560	g	-

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

Version 3.0

Approval

2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1)
Operating Ambient Temperature	T_{OP}	0	+50	ºC	(1), (2)
Shock (Non-Operating)	S_{NOP}	-	220G/2ms	G/ms	(3), (5)
Vibration (Non-Operating)	V_{NOP}	-	1.5	G	(4), (5)

Note (1)   (a) 90 %RH Max. (Ta <= 40 ºC).
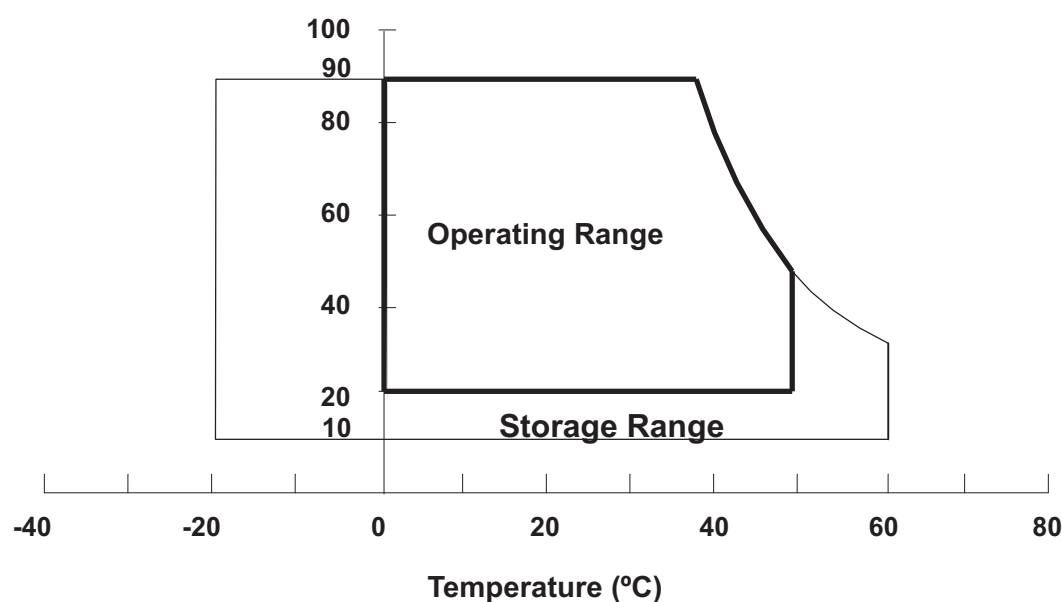
(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

(c) No condensation.

Note (2)   The temperature of panel surface should be 0 ºC min. and 60 ºC max.

**Relative Humidity (%RH)**

Note (3)   1 time for ± X, ± Y, ± Z. for Condition (220G / 2ms) is half Sine Wave,.

Note (4)   10~500 Hz, 0.5hr/cycle 1cycle for X,Y,Z

Note (5)   At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid

enough so that the module would not be twisted or bent by the fixture.

The fixing condition is shown as below:

Version 3.0

Doc No.:
Issued Date: Jun. 04, 2007
Model No.: N154I2-L02 (NF4I202908)

Approval
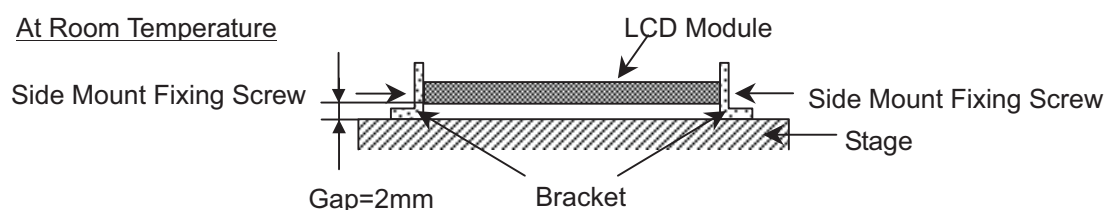
2.2 ELECTRICAL ABSOLUTE RATINGS

2.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	Vcc	-0.3	+4.0	V	(1)
Logic Input Voltage	V_{IN}	-0.3	Vcc+0.3	V	

2.2.2 BACKLIGHT UNIT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Lamp Voltage	V_L	-	2.5K	V_{RMS}	(1), (2), I_L = 6.0 mA
Lamp Current	I_L	-	6.5	mA_{RMS}	(1), (2)
Lamp Frequency	F_L	-	80	KHz	

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation

should be restricted to the conditions described under Normal Operating Conditions.

Note (2) Specified values are for lamp (Refer to Section 3.2 for further information).

Version 3.0

14076426

Approval

3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

Ta = 25 ± 2 ℃

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		Vcc	3.0	3.3	3.6	V	-
Rush Current		I_{RUSH}			1.5	A	(2)
Initial Stage Current		I_{IS}			1.0	A	(2)
Power Supply Current	White	Icc		240		mA	(3)a
	Black			330		mA	(3)b
LVDS Differential Input High Threshold		$V_{TH(LVDS)}$			+100	mV	(5), V_{CM}=1.2V
LVDS Differential Input Low Threshold		$V_{TL(LVDS)}$	-100			mV	(5) V_{CM}=1.2V
LVDS Common Mode Voltage		V_{CM}	1.125		1.375	V	(5)
LVDS Differential Input Voltage		$|V_{ID}|$	100		600	mV	(5)
Terminating Resistor		R_T		100		Ohm	
Power per EBL WG		P_{EBL}	-	3.3	-	W	(4)

Note (1) The ambient temperature is Ta = 25 ± 2 ℃.

Note (2) I_{RUSH}: the maximum current when VCC is rising

I_{IS}: the maximum current of the first 100ms after power-on

Measurement Conditions: Shown as the following figure. Test pattern: black.

Version 3.0

CHI MEI OPTOELECTRONICS CORP.

Approval
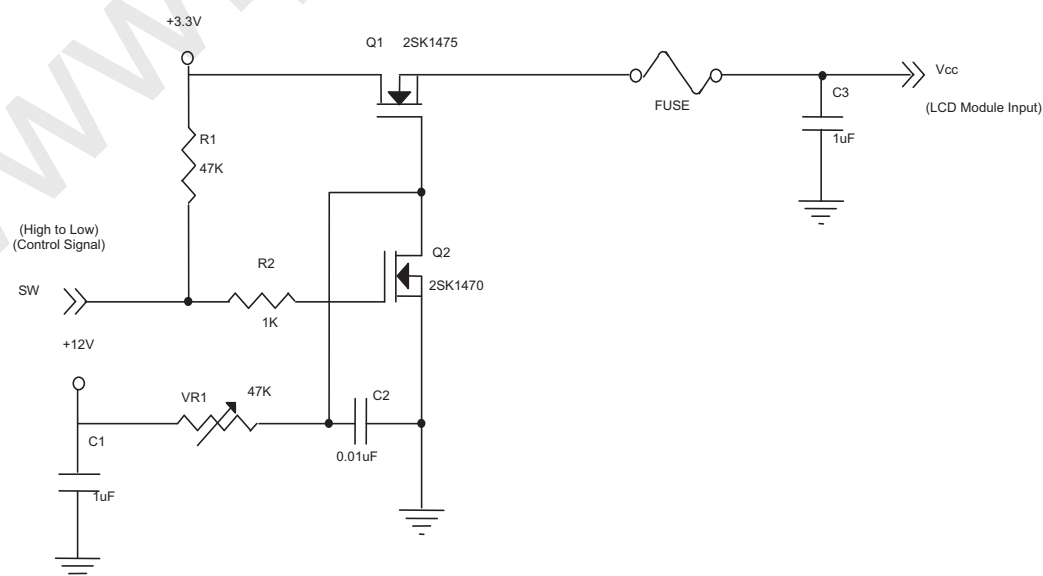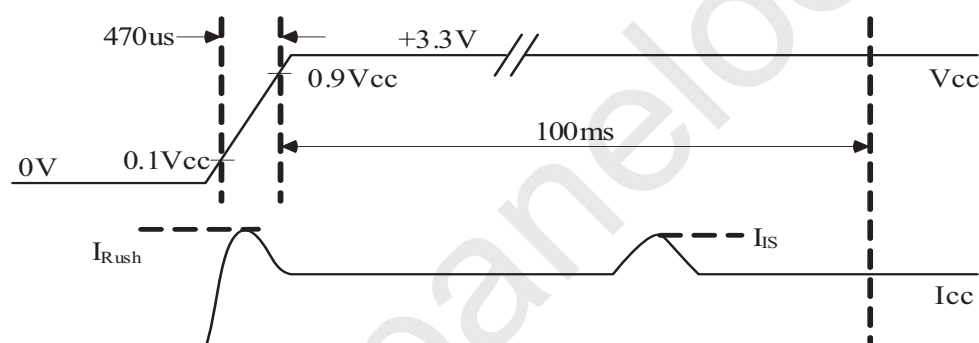
Note (3) The specified power supply current is under the conditions at Vcc = 3.3 V, Ta = 25 ± 2 ºC, DC Current and f_v = 60 Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern

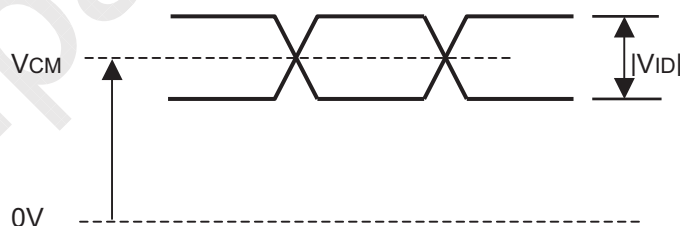Active Area

b. Black Pattern

Active Area

Note (4) The specified power are the sum of LCD panel electronics input power and the inverter input power. Test conditions are as follows.

(a) Vcc = 3.3 V, Ta = 25 ± 2 ºC, f_v = 60 Hz,

(b) The pattern used is a black and white 32 x 36 checkerboard, slide #100 from the VESA file "Flat Panel Display Monitor Setup Patterns", FPDMSU.ppt.

(c) Luminance: 60 nits.

(d) The inverter used is provided from Sumida. Please contact Sumida for detail information. CMO don't provide the inverter in this product.

Note (5)The parameters of LVDS signals are defined as the following figures

Single Ended

V_{CM}

$|V_{ID}|$

0V

Differential

$V_{TH(LVDS)}$

$|V_{ID}|$

0V

$V_{TL(LVDS)}$

Version 3.0

14076426

Doc No.:
Issued Date: Jun. 04, 2007
Model No.: N154I2-L02 (NF4I202908)

Approval
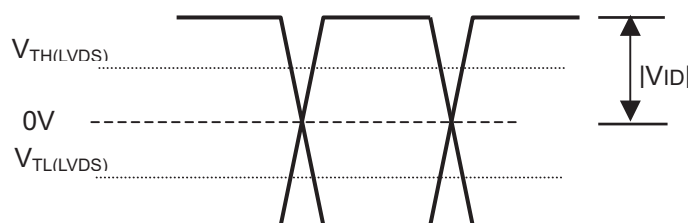
3.2 BACKLIGHT UNIT
Ta = 25 ± 2 ºC

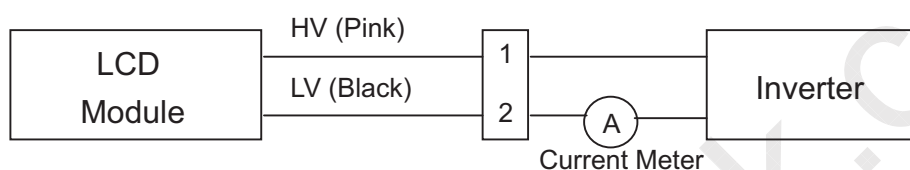| Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Lamp Input Voltage	V_L	608	675	743	V_{RMS}	I_L = 6.0 mA
Lamp Current	I_L	2.0	-	6.5	mA_{RMS}	(1),(2)
		-				(1),(3)
Lamp Turn On Voltage	V_S	-	-	900(25 ^{o}C)	V_{RMS}	(4)
		-	-	1000(0 ^{o}C)	V_{RMS}	(4)
Operating Frequency	F_L	40	-	80	KHz	(5)
Lamp Life Time	L_{BL}	12,000	-	-	Hrs	(7)
Power Consumption	P_L	-	4.2	-	W	(4), I_L = 6.0 mA

Note (1) Lamp current is measured by utilizing a high frequency current meter as shown below:

Note (2) The voltage shown above should be applied to the lamp for more than 1 second after startup. Otherwise the lamp may not be turned on.

Note (3) The lamp frequency may produce interference with horizontal synchronous frequency from the display, and this may cause line flow on the display. In order to avoid interference, the lamp frequency should be detached from the horizontal synchronous frequency and its harmonics as far as possible.
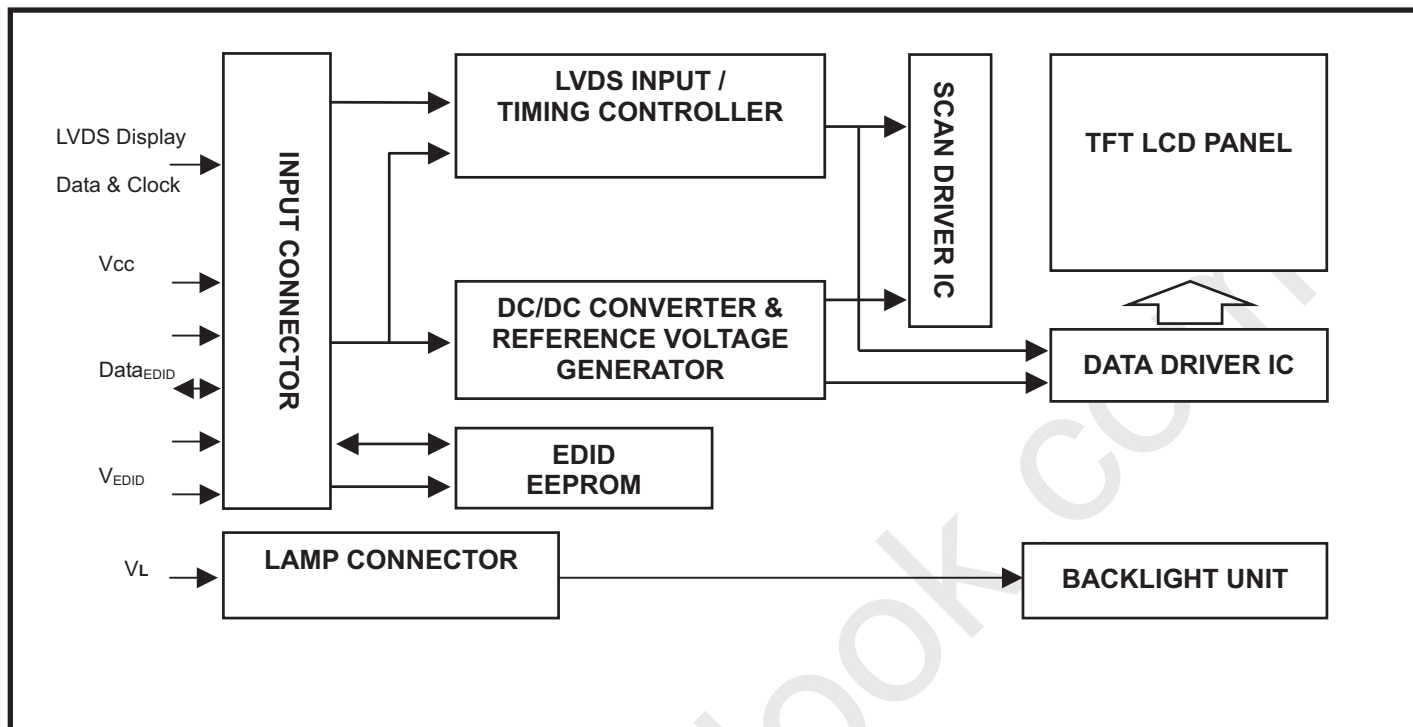
Note (4) $P_L = I_L \times V_L$

Note (5) The lifetime of lamp can be defined as the time in which it continues to operate under the condition Ta = 25 $\pm$2 ^{o}C and I_L = 6.5 mArms until one of the following events occurs:

(a) When the brightness becomes or lower than 50% of its original value.

(b) When the effective ignition length becomes or lower than 80% of its original value. (Effective ignition length is defined as an area that has less than 70% brightness compared to the brightness in the center point.)

Note (6) The waveform of the voltage output of inverter must be area-symmetric and the design of the inverter must have specifications for the modularized lamp. The performance of the Backlight, such as lifetime or brightness, is greatly influenced by the characteristics of the DC-AC inverter for the lamp. All the parameters of an inverter should be carefully designed to avoid producing too much current leakage from high voltage output of the inverter. When designing or ordering the inverter please make sure that a poor lighting caused by the mismatch of the Backlight and the inverter (miss-lighting, flicker, etc.) never occurs. If the above situation is confirmed, the module should be operated in the same manners when it is installed in your instrument.

Version 3.0

14076426

Doc No.:
Issued Date: Jun. 04, 2007
Model No.: N154I2-L02 (NF4I202908)

Approval

4. BLOCK DIAGRAM

4.1 TFT LCD MODULE

| LVDS Display Data & Clock | INPUT CONNECTOR | LVDS INPUT / TIMING CONTROLLER | SCAN DRIVER IC | TFT LCD PANEL |

Input blocks:
- LVDS Display Data & Clock
- Vcc
- $Data_{EDID}$
- V_{EDID}
- V_L

Function blocks:
- INPUT CONNECTOR
- LVDS INPUT / TIMING CONTROLLER
- DC/DC CONVERTER & REFERENCE VOLTAGE GENERATOR
- EDID EEPROM
- LAMP CONNECTOR
- SCAN DRIVER IC
- TFT LCD PANEL
- DATA DRIVER IC
- BACKLIGHT UNIT

4.2 BACKLIGHT UNIT

1 HV (Pink)
2 LV (Black)

Version 3.0

Approval

5. INPUT TERMINAL PIN ASSIGNMENT

5.1 TFT LCD MODULE

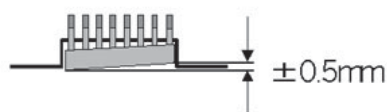| Pin	Symbol	Description	Polarity	Remark
1	Vss	Ground		-
2	Vcc	Power Supply +3.3 V		-
3	Vcc	Power Supply +3.3 V		-
4	V_{EDID}	DDC +3.3 V		-
5	NC	-	-	-
6	CLK_{EDID}	DDC Clock		-
7	$Data_{EDID}$	DDC Data		-
8	Rxin0-	LVDS Differential Data Input	Negative	-
9	Rxin0+	LVDS Differential Data Input	Positive	
10	Vss	Ground		-
11	Rxin1-	LVDS Differential Data Input	Negative	-
12	Rxin1+	LVDS Differential Data Input	Positive	
13	Vss	Ground		-
14	Rxin2-	LVDS Differential Data Input	Negative	-
15	Rxin2+	LVDS Differential Data Input	Positive	
16	Vss	Ground		-
17	CLK-	LVDS Clock Data Input	Negative	-
18	CLK+	LVDS Clock Data Input	Positive	
19	Vss	Ground		-
20	NC	-	-	-
21	NC	-	-	-
22	NC		-	-
23	NC	-	-	-
24	NC	-	-	-
25	NC		-	-
26	NC	-	-	-
27	NC	-	-	-
28	NC		-	-
29	NC	-	-	-
30	NC	-	-	-

Note (1) Connector Part No.: JAE-FI-XB30SRL-HF11.

Note (2) User's connector Part No: JAE-FI-X30C2L.

Note (3) The first pixel is odd as shown in the following figure

Version 3.0

Doc No.:
Issued Date: Jun. 04, 2007
Model No.: N154I2-L02 (NF4I202908)

Approval
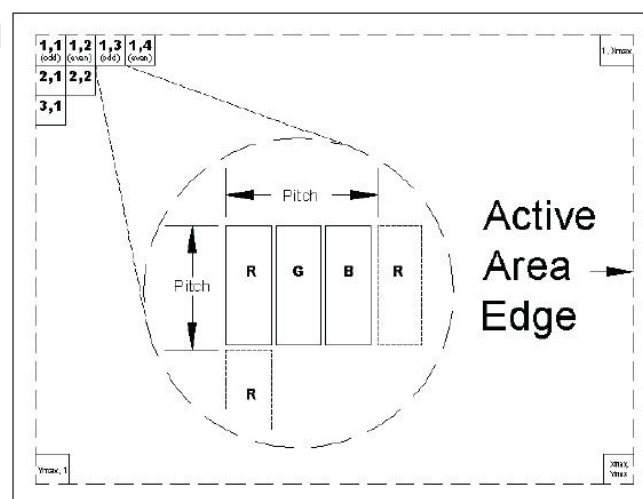
Note (4) Mounting inclination of a connector carries out as follows.

±0.5mm

5.2 BACKLIGHT UNIT

Pin	Symbol	Description	Color
1	HV	High Voltage	Pink
2	LV	Ground	Black

Note (1) Connector Part No.: JST-BHSR-02VS-1.

Note (2) User's connector Part No.: JST-SM02B-BHSS-1-TB.

5.3 TIMING DIAGRAM OF LVDS INPUT SIGNAL

CLK+							
Rxin2 $T/7$	IN20	IN19	IN18	IN17	IN16	IN15	IN14
	DE	Vsync	Hsync	B5	B4	B3	B2
Rxin1	IN13	IN12	IN11	IN10	IN9	IN8	IN7
	B1	B0	G5	G4	G3	G2	G1
Rxin0	IN6	IN5	IN4	IN3	IN2	IN1	IN0
	G0	R5	R4	R3	R2	R1	R0

Signal for 1 DCLK Cycle (T)

Version 3.0

Doc No.:
Issued Date: Jun. 04, 2007
Model No.: N154I2-L02 (NF4I202908)

Approval
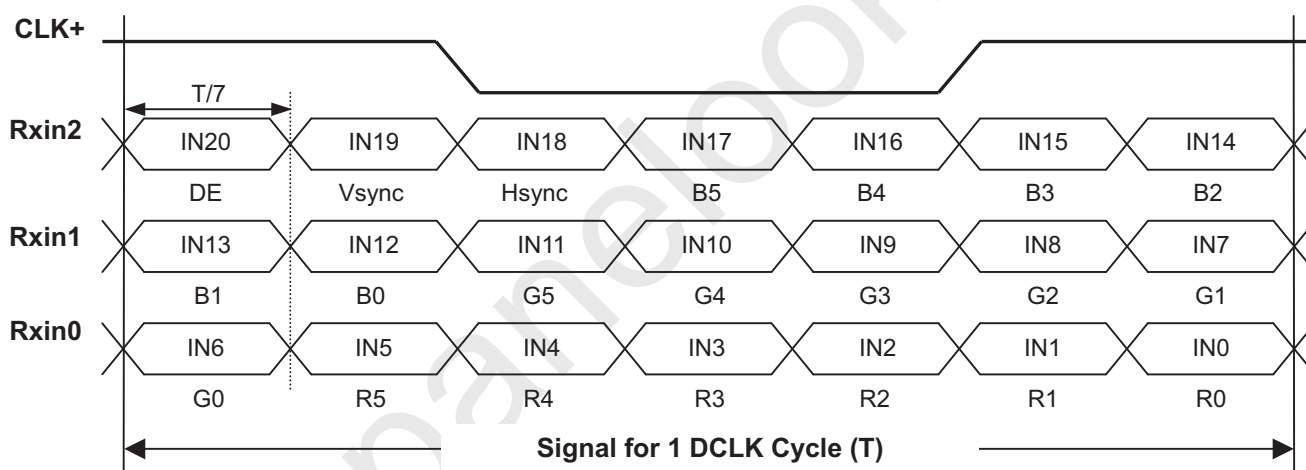
5.4 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 6-bit gray scale data input for the color. The higher the binary input the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																		
		Red						Green						Blue					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(61)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage

Version 3.0

Doc No.:
Issued Date: Jun. 04, 2007
Model No.: N154I2-L02 (NF4I202908)

Approval

5.5 EDID DATA STRUCTURE

The EDID (Extended Display Identification Data) data formats are to support displays as defined in the

VESA Plug & Display and FPDI standards.

Byte #(decimal)	Byte #(hex)	Field Name and Comments	Value(hex)	Value(binary)
0	0	Header	00	00000000
1	1	Header	FF	11111111
2	2	Header	FF	11111111
3	3	Header	FF	11111111
4	4	Header	FF	11111111
5	5	Header	FF	11111111
6	6	Header	FF	11111111
7	7	Header	00	00000000
8	8	EISA ID manufacturer name ("CMO")	0D	00001101
9	9	EISA ID manufacturer name (Compressed ASCII)	AF	10101111
10	0A	ID product code (N154I2-L02)	26	00100110
11	0B	ID product code (hex LSB first; N154I2-L02)	15	00010101
12	0C	ID S/N (fixed "0")	00	00000000
13	0D	ID S/N (fixed "0")	00	00000000
14	0E	ID S/N (fixed "0")	00	00000000
15	0F	ID S/N (fixed "0")	00	00000000
16	10	Week of manufacture (fixed "00H")	09	00001001
17	11	Year of manufacture (fixed "00H")	10	00010000
18	12	EDID structure version # ("1")	01	00000001
19	13	EDID revision # ("3")	03	00000011
20	14	Video I/P definition ("digital")	80	10000000
21	15	Max H image size ("33cm")	21	00100001
22	16	Max V image size ("21cm")	15	00010101
23	17	Display Gamma (Gamma = "2.2")	78	01111000
24	18	Feature support ("Active off, RGB Color")	0A	00001010
25	19	Red/Green (Rx1, Rx0, Ry1, Ry0, Gx1, Gx0, Gy1, Gy0)	C6	11000110
26	1A	Blue/White (Bx1, Bx0, By1, By0, Wx1, Wx0, Wy1, Wy0)	A9	10101001
27	1B	Red-x (Rx = "0.604")	9A	10011010
28	1C	Red-y (Ry = "0.340")	57	01010111
29	1D	Green-x (Gx = "0.306")	4E	01001110
30	1E	Green-y (Gy = "0.521")	85	10000101
31	1F	Blue-x (Bx = "0.150")	26	00100110
32	20	Blue-y (By = "0.119")	1E	00011110
33	21	White-x (Wx = "0.314")	50	01010000
34	22	White-y (Wy = "0.321")	52	01010010
35	23	Established timings 1	00	00000000
36	24	Established timings 2	00	00000000
37	25	Manufacturer's reserved timings	00	00000000
38	26	Standard timing ID # 1	01	00000001
39	27	Standard timing ID # 1	01	00000001

Version 3.0

Approval

40	28	Standard timing ID # 2	01	00000001
41	29	Standard timing ID # 2	01	00000001
42	2A	Standard timing ID # 3	01	00000001
43	2B	Standard timing ID # 3	01	00000001
44	2C	Standard timing ID # 4	01	00000001
45	2D	Standard timing ID # 4	01	00000001
46	2E	Standard timing ID # 5	01	00000001
47	2F	Standard timing ID # 5	01	00000001
48	30	Standard timing ID # 6	01	00000001
49	31	Standard timing ID # 6	01	00000001
50	32	Standard timing ID # 7	01	00000001
51	33	Standard timing ID # 7	01	00000001
52	34	Standard timing ID # 8	01	00000001
53	35	Standard timing ID # 8	01	00000001
54	36	Detailed timing description # 1 Pixel clock ("71MHz", According to VESA CVT Rev1.1)	BC	10111100
55	37	# 1 Pixel clock (hex LSB first)	1B	00011011
56	38	# 1 H active ("1280")	00	00000000
57	39	# 1 H blank ("160")	A0	10100000
58	3A	# 1 H active : H blank ("1280 : 160")	50	01010000
59	3B	# 1 V active ("800")	20	00100000
60	3C	# 1 V blank ("23")	17	00010111
61	3D	# 1 V active : V blank ("800 :23")	30	00110000
62	3E	# 1 H sync offset ("48")	30	00110000
63	3F	# 1 H sync pulse width ("32")	20	00100000
64	40	# 1 V sync offset : V sync pulse width ("3 : 6")	36	00110110
65	41	# 1 H sync offset : H sync pulse width : V sync offset : V sync width ("48: 32 : 3 : 6")	00	00000000
66	42	# 1 H image size ("331 mm")	4B	01001011
67	43	# 1 V image size ("207 mm")	CF	11001111
68	44	# 1 H image size : V image size ("331 : 207")	10	00010000
69	45	# 1 H boarder ("0")	00	00000000
70	46	# 1 V boarder ("0")	00	00000000
71	47	# 1 Non-interlaced, Normal, no stereo, Separate sync, H/V pol Negatives	18	00011000
72	48	Detailed timing description # 2	00	00000000
73	49	# 2 Flag	00	00000000
74	4A	# 2 Reserved	00	00000000
75	4B	# 2 FE (hex) defines ASCII string (Model Name "N154I2-L02", ASCII)	FE	11111110
76	4C	# 2 Flag	00	00000000
77	4D	# 2 1st character of name ("N")	4E	01001110
78	4E	# 2 2nd character of name ("1")	31	00110001
79	4F	# 2 3rd character of name ("5")	35	00110101
80	50	# 2 4th character of name ("4")	34	00110100
81	51	# 2 5th character of name ("I")	49	01001001
82	52	# 2 6th character of name ("2")	32	00110010
83	53	# 2 7th character of name ("-")	2D	00101101

Version 3.0

Approval

84	54	# 2 8th character of name ("L")	4C	01001100
85	55	# 2 9th character of name ("0")	30	00110000
86	56	# 2 9th character of name ("2")	32	00110010
87	57	# 2 New line character indicates end of ASCII string	0A	00001010
88	58	# 2 Padding with "Blank" character	20	00100000
89	59	# 2 Padding with "Blank" character	20	00100000
90	5A	Detailed timing description # 3	00	00000000
91	5B	# 3 Flag	00	00000000
92	5C	# 3 Reserved	00	00000000
93	5D	# 3 FE (hex) defines ASCII string (Vendor "CMO", ASCII)	FE	11111110
94	5E	# 3 Flag	00	00000000
95	5F	# 3 1st character of string ("C")	43	01000011
96	60	# 3 2nd character of string ("M")	4D	01001101
97	61	# 3 3rd character of string ("O")	4F	01001111
98	62	# 3 New line character indicates end of ASCII string	0A	00001010
99	63	# 3 Padding with "Blank" character	20	00100000
100	64	# 3 Padding with "Blank" character	20	00100000
101	65	# 3 Padding with "Blank" character	20	00100000
102	66	# 3 Padding with "Blank" character	20	00100000
103	67	# 3 Padding with "Blank" character	20	00100000
104	68	# 3 Padding with "Blank" character	20	00100000
105	69	# 3 Padding with "Blank" character	20	00100000
106	6A	# 3 Padding with "Blank" character	20	00100000
107	6B	# 3 Padding with "Blank" character	20	00100000
108	6C	Detailed timing description # 4	00	00000000
109	6D	# 4 Flag	00	00000000
110	6E	# 4 Reserved	00	00000000
111	6F	# 4 FE (hex) defines ASCII string (Model Name"N154I2-L02", ASCII)	FE	11111110
112	70	# 4 Flag	00	00000000
113	71	# 4 1st character of name ("N")	4E	01001110
114	72	# 4 2nd character of name ("1")	31	00110001
115	73	# 4 3rd character of name ("5")	35	00110101
116	74	# 4 4th character of name ("4")	34	00110100
117	75	# 4 5th character of name ("I")	49	01001001
118	76	# 4 6th character of name ("2")	32	00110010
119	77	# 4 7th character of name ("-")	2D	00101101
120	78	# 4 8th character of name ("L")	4C	01001100
121	79	# 4 9th character of name ("0")	30	00110000
122	7A	# 4 9th character of name ("2")	32	00110010
123	7B	# 4 New line character indicates end of ASCII string	0A	00001010
124	7C	# 4 Padding with "Blank" character	20	00100000
125	7D	# 4 Padding with "Blank" character	20	00100000
126	7E	Extension flag	00	00000000
127	7F	Checksum	88	10001000

Version 3.0

Approval

5.6 EDID SIGINAL SPECIFICATION

(1) EDID Power

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power supply voltage	Vcc	Read Operation	2.2	—	5.5	V
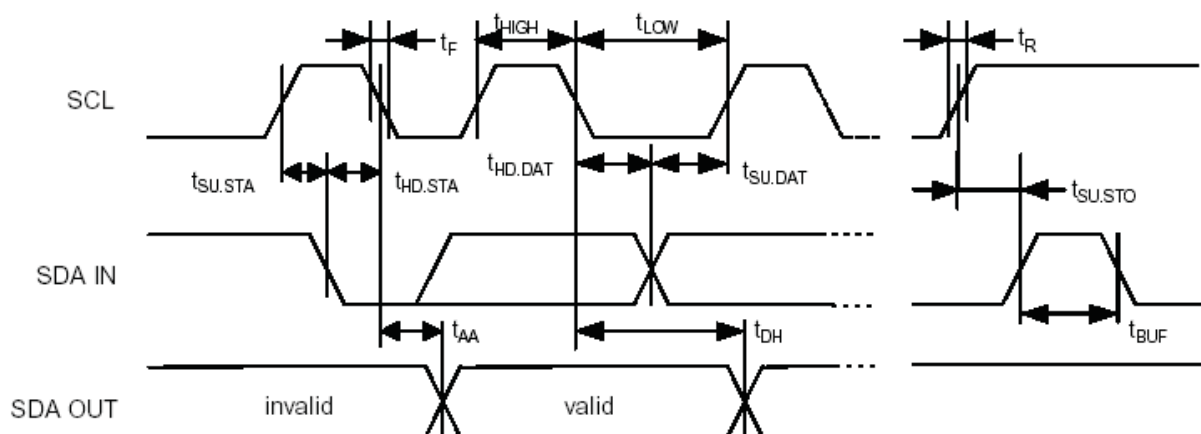
(2) DC characteristics

		Symbol	Min.	Max.	Unit	Index
SCL, SDA terminal input voltage	High Voltage	VIH	$0.7 \times V_{CC}$	—	V	
	Low Voltage	VIL	—	$0.3 \times V_{CC}$	V	
Hysteresis Voltage		VHYS	0.05 VCC	—	V	
Output Voltage		VOL1 VOL2	—	0.4 0.6	V	IOL=3mA, CC=2.5V IOL=6mA, CC=2.5V
Input Leak current (Vin =0.1V~VCC)		ILI	-10 -10	10 50	uA	WP=VSS WP=VCC
Output Leak current		ILO	-10	10	uA	Vout =0.1V~VCC, WP=VSS
Terminal capacity(Input, Output)		Cin, Cout	—	10	pF	VCC=5.0V Ta=25^{0}C, Fclk=1.0MHz
Operating current		ICC Write ICC Read	—	3 1	mA	VCC=5.5V, SCL=400KHz
Stillness current (SDA=SCL=VCC) (WP=VSS,A0,A1,A2=VSS)		ICCS	—	30 100	uA	VCC=3.0V VCC=5.5V

Version 3.0

Doc No.:
Issued Date: Jun. 04, 2007
Model No.: N154I2-L02 (NF4I202908)

Approval

(3) AC characteristics (VCC=2.5~5.5V standard operation mode)

Item	Symbol	VCC=2.5V-5.5V (Standard operation mode)		VCC=4.5V-5.5V (High-speed operation mode)		Unit	Index
		Min.	Max.	Min.	Max.		
Clock frequency	Fclk	—	100	—	400	KHz	
Clock High Time	THIGH	4000	—	900	—	ns	
Clock Low Time	TLOW	4700	—	1300	—	ns	
SDA, SCL falling time	TR	—	1000	—	300	ns	
SDA, SCL rising time	TF	—	300	—	300	ns	
START hold time	THD:STA	4000	—	600	—	ns	
START setup time	TSU:STA	4700	—	600	—	ns	
Data input hold time	THD:Data	0	—	0	—	ns	
Data input setup time	TSU:Data	250	—	100	—	ns	
STOP setup time	TSU:STO	4700	—	600	—	ns	
Output decision time from a clock	TAA	—	3500	100	900	ns	
Bus free time	TBUF	4700	—	1300	—	ns	
Rising time of Min VIH, VIL	TOF	—	250	20	250	ns	CB$\leq$100pF
Spike oppression	TSP	—	50	—	50	ns	
A write-in cycle time	TWR	—	10	—	10	ms	Byte and page mode
The number of times of data rewriting	—	1M	—	1M	—	cycles	VCC=5.0V Ta=25^0C,

18 / 31

Version 3.0

Doc No.:
Issued Date: Jun. 04, 2007
Model No.: N154I2-L02 (NF4I202908)

Approval

6. INTERFACE TIMING

6.1 INPUT SIGNAL TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Frequency	1/Tc	-	71	80	MHz	-
DE	Vertical Total Time	TV	810	823	1000	TH	-
	Vertical Addressing Time	TVD	800	800	800	TH	-
	Horizontal Total Time	TH	1360	1440	1600	Tc	-
	Horizontal Addressing Time	THD	1280	1280	1280	Tc	-

INPUT SIGNAL TIMING DIAGRAM

Version 3.0

Doc No.:
Issued Date: Jun. 04, 2007
Model No.: N154I2-L02 (NF4I202908)

Approval
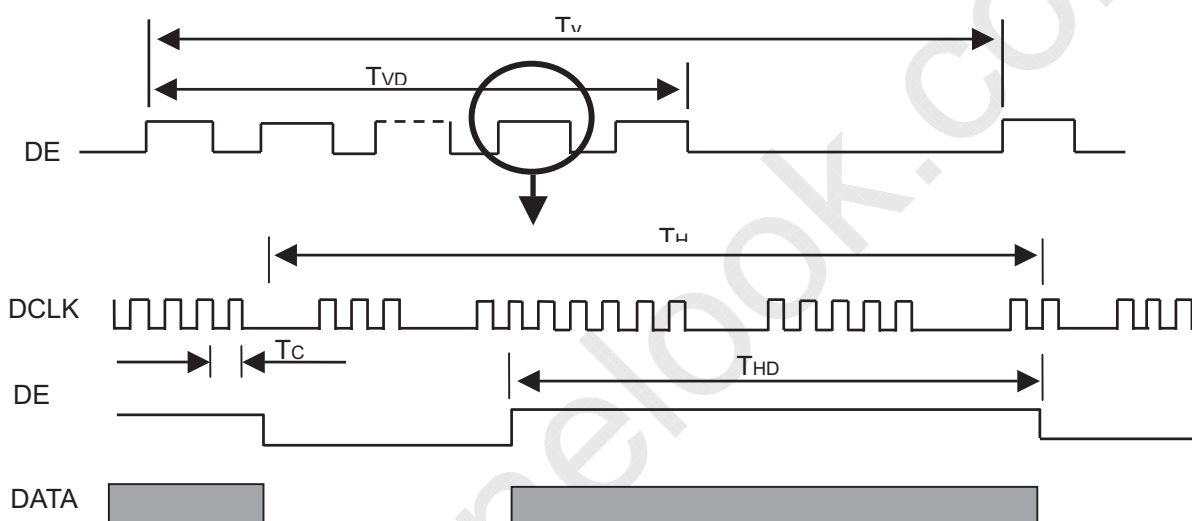
6.2 POWER ON/OFF SEQUENCE
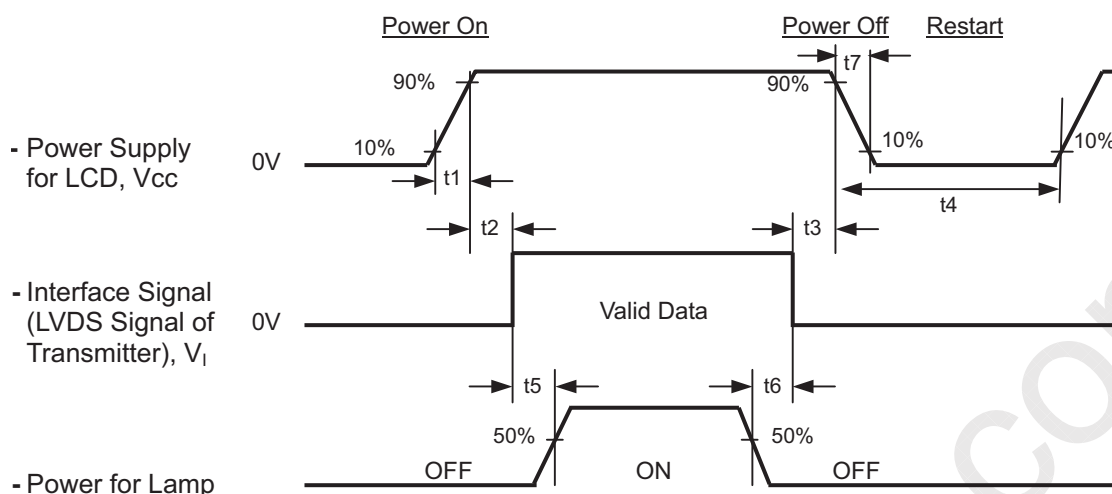
Timing Specifications:

$0 < t1 \leqq 20$ msec

$0 < t2 \leqq 50$ msec

$0 < t3 \leqq 50$ msec

$t4 \geqq 250$ msec

$t5 \geqq 100$ msec

$t6 \geqq 0$ msec

$0 < t7 \leqq 50$ msec (given by system)

Note (1) Please avoid floating state of interface signal at invalid period.

Note (2) When the interface signal is invalid, be sure to pull down the power supply of LCD Vcc to 0 V.

Note (3) The Backlight inverter power must be turned on after the power supply for the logic and the interface signal is valid. The Backlight inverter power must be turned off before the power supply for the logic and the interface signal is invalid.

Note (4) Sometimes some slight noise shows when LCD is turned off (even backlight is already off). To avoid this phenomenon, we suggest that the Vcc falling time had better to follow

$t7 >= 5$ msec

Version 3.0

14076426

Approval

6.3 Momentary Voltage Drops
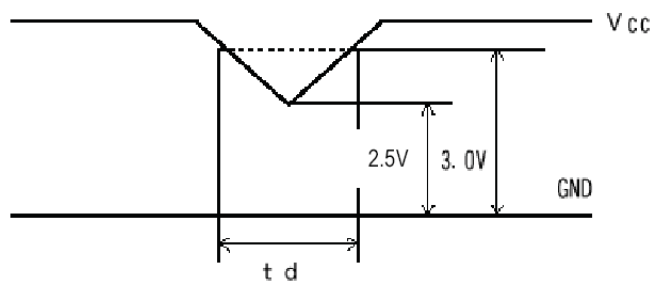
(1)   When 2.5V ≦ Vcc ＜3.0V and td≦10ms , the unit must work normally when VCC return to 3.0V..

(2)   When Vcc < 2.5V, momentary voltage shall conform to the input voltage sequence.

Version 3.0

14076426

Approval

7. OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	^{o}C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	3.3	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Inverter Current	I_L	6.0	mA
Inverter Driving Frequency	F_L	55	KHz
Inverter	Sumida-H05-4915		

   The measurement methods of optical characteristics are shown in Section 7.2. The following items should be measured under the test conditions described in Section 7.1 and stable environment shown in Note (6).

7.2 OPTICAL SPECIFICATIONS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR		280	400	-	-	(2), (5)
Response Time		T_R		-	5	10	ms	(3)
		T_F		-	11	16	ms	
Central Luminance of White		L_C		180	210		cd/m^2	(4), (6)
Average Luminance of White		L_{AVE}		170	200	-	cd/m^2	
Color Chromaticity	Red	Rx	θ_x=0°, θ_Y=0° Viewing Normal Angle	TYP. -0.03	0.598	TYP. +0.03	-	(1)
		Ry			0.345		-	
	Green	Gx			0.301		-	
		Gy			0.533		-	
	Blue	Bx			0.153		-	
		By			0.124		-	
	White	Wx			0.313		-	
		Wy			0.329		-	
	Color Gamut	C.G.		42	45		%	(7)
Viewing Angle	Horizontal	θ_x+	CR≥10	40	45	-	Deg.	(1),(5)
		θ_x-		40	45	-		
	Vertical	θ_Y+		15	20	-		
		θ_Y-		40	45	-		
White Variation of 5 Points		δW_{5p}	θ_x=0°, θ_Y=0° (BM-5A)	80	-	-	%	(5),(6)
White Variation of 13 Points		δW_{13p}		65	-	-	%	

Version 3.0

Doc No.:
Issued Date: Jun. 04, 2007
Model No.: N154I2-L02 (NF4I202908)

Approval

Note (1) Definition of Viewing Angle (θx, θy):

Normal

θx = θy = 0°

θy-   θy+

θx- = 90°   x-

y+

θx−   12 o'clock direction

θy+ = 90°

θx+

6 o'clock   y-

θy- = 90°

x+   θx+ = 90°
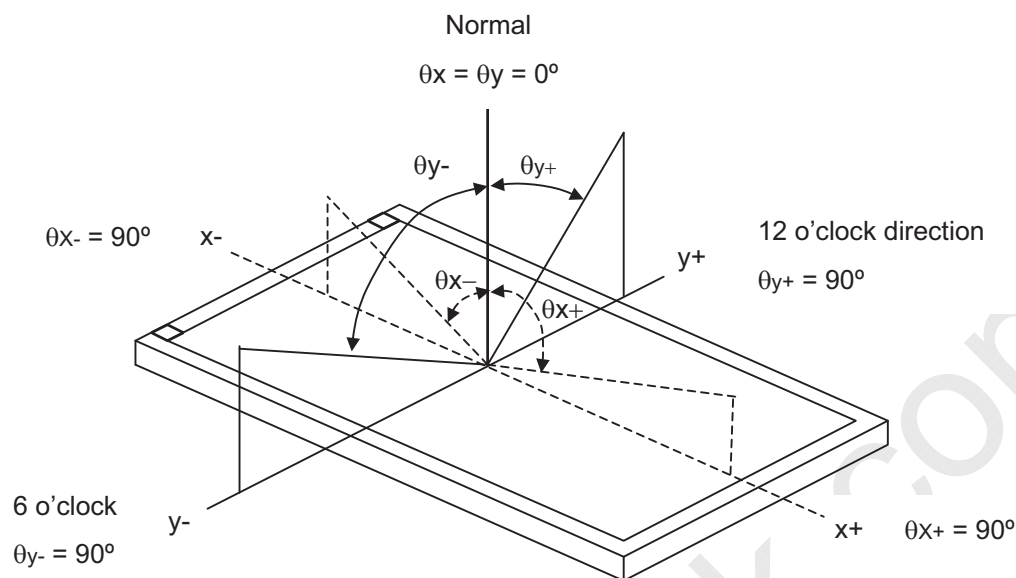
Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.
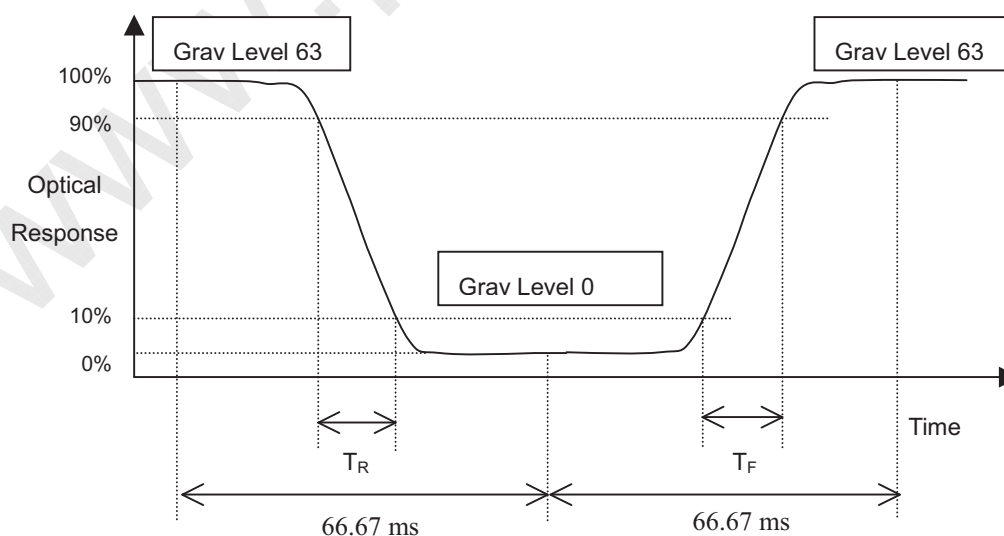
Contrast Ratio (CR) = L63 / L0

L63: Luminance of gray level 63

L 0: Luminance of gray level 0

CR = CR (5)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

Note (3) Definition of Response Time (T_R, T_F):

Grav Level 63   Grav Level 63

100%

90%

Optical

Response

Grav Level 0

10%

0%

Time

T_R T_F

66.67 ms   66.67 ms

Version 3.0

Doc No.:
Issued Date: Jun. 04, 2007
Model No.: N154I2-L02 (NF4I202908)

Approval

Note (4) Definition of Average Luminance of White (L_{AVE}):

Measure the luminance of gray level 63 at 5 points

L_{AVE} = [L (1)+ L (2)+ L (3)+ L (4)+ L (5)] / 5

L (x) is corresponding to the luminance of the point X at Figure in Note (6)

Note (5) Measurement Setup:

The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.

LCD Module

LCD Panel

Center of the Screen

Photometer
(CA210, CS-1000T)

Field of View = 1º

500 mm

Light Shield Room

(Ambient Luminance < 2 lux)

Version 3.0

Approval
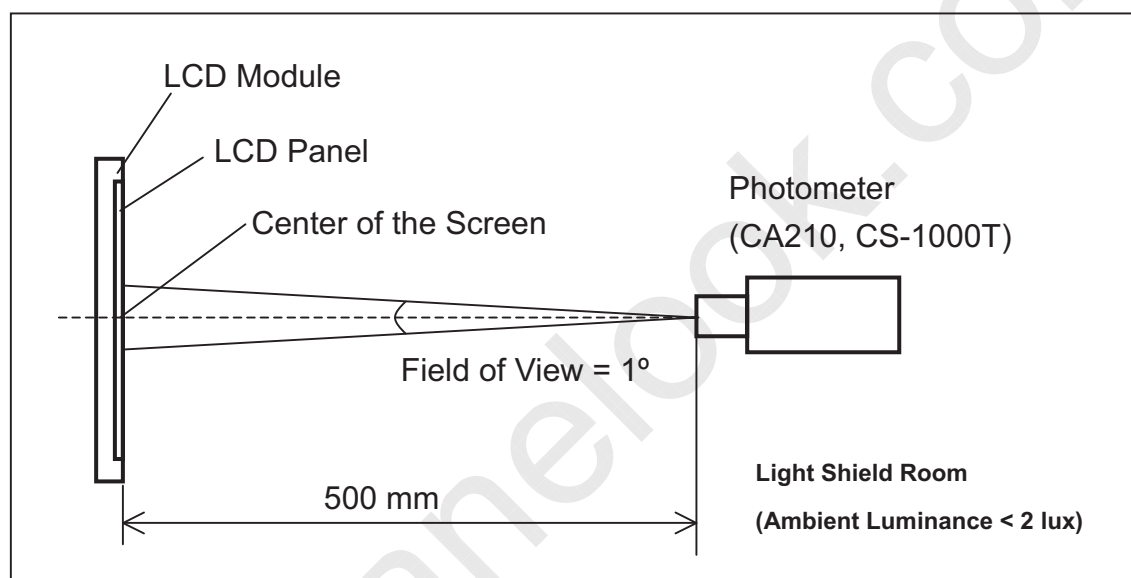
Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 63 at 5 points

δW_{5p} = Minimum [L (10)+ L (11)+ L (12)+ L (13)+ L (5)] / Maximum [L (10)+ L (11)+ L (12)+ L (13)+ L (5)]

δW_{13p} = Minimum [L (1) ~ L (13)] / Maximum [L (1) ~ L (13)]
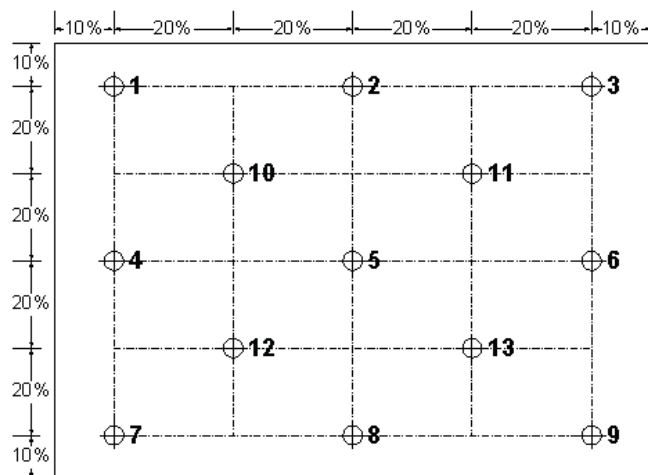
Active area

$\boxed{X}$: Test Point

X=1 to 13

Note (7) Definition of color gamut (C.G%):

C.G%=　R G B /　R_0 G_0 B_0,*100%

R_0, G_0, B_0 : color coordinates of red, green, and blue defined by NTSC, respectively.

R, G, B : color coordinates of module on 63 gray levels of red, green, and blue, respectively.

R_0 G_0 B_0 : area of triangle defined by R_0, G_0, B_0

． R G B: area of triangle defined by R, G, B

Version 3.0

Approval
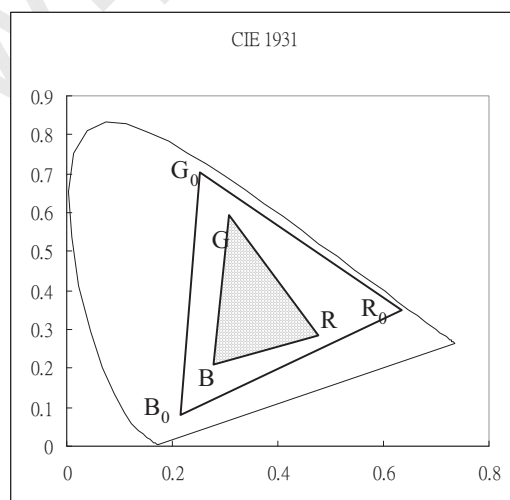
8. PRECAUTIONS

8.1 HANDLING PRECAUTIONS

(1) The module should be assembled into the system firmly by using every mounting hole. Be careful not to twist or bend the module.

(2) While assembling or installing modules, it can only be in the clean area. The dust and oil may cause electrical short or damage the polarizer.

(3) Use fingerstalls or soft gloves in order to keep display clean during the incoming inspection and assembly process.

(4) Do not press or scratch the surface harder than a HB pencil lead on the panel because the polarizer is very soft and easily scratched.

(5) If the surface of the polarizer is dirty, please clean it by some absorbent cotton or soft cloth. Do not use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanently damage the polarizer due to chemical reaction.

(6) Wipe off water droplets or oil immediately. Staining and discoloration may occur if they left on panel for a long time.

(7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contacting with hands, legs or clothes, it must be washed away thoroughly with soap.

(8) Protect the module from static electricity, it may cause damage to the C-MOS Gate Array IC.

(9) Do not disassemble the module.

(10) Do not pull or fold the lamp wire.

(11) Pins of I/F connector should not be touched directly with bare hands.

8.2 STORAGE PRECAUTIONS

(1) High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.

(2) It is dangerous that moisture come into or contacted the LCD module, because the moisture may damage LCD module when it is operating.

(3) It may reduce the display quality if the ambient temperature is lower than 10 ºC. For example, the response time will become slowly, and the starting voltage of lamp will be higher than the room temperature.

8.3 OPERATION PRECAUTIONS

(1) Do not pull the I/F connector in or out while the module is operating.

(2) Always follow the correct power on/off sequence when LCD module is connecting and operating. This can prevent the CMOS LSI chips from damage during latch-up.

(3) The startup voltage of Backlight is approximately 1000 Volts. It may cause electrical shock while assembling with inverter. Do not disassemble the module or insert anything into the Backlight unit.
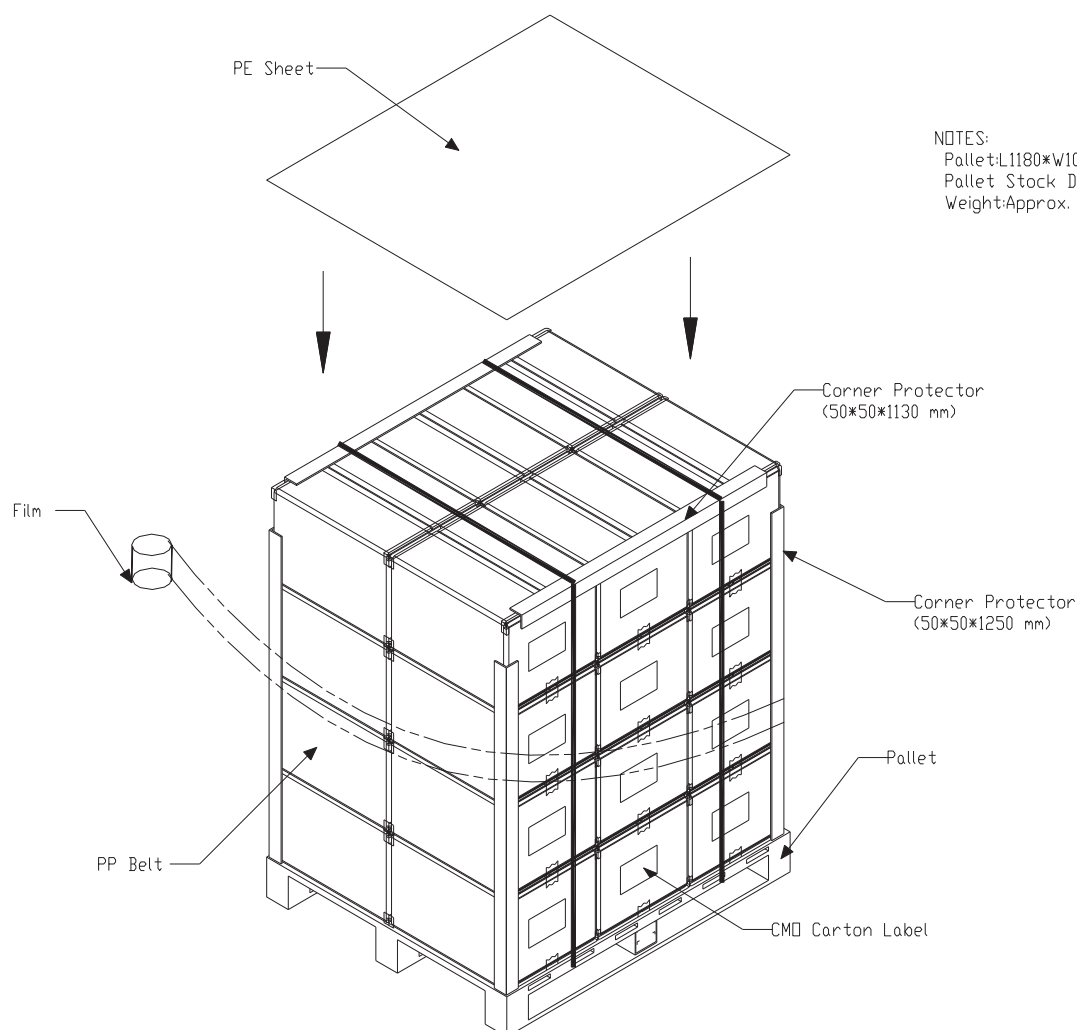
Version 3.0

Doc No.:
Issued Date: Jun. 04, 2007
Model No.: N154I2-L02 (NF4I202908)

Approval

9. PACKING

9.1 CARTON

Box Dimension: 489(L)*382(W)*330(H)
Weight: Approx. 10.8 kg(15 module .per. 1 box)

Packing testing criteria :
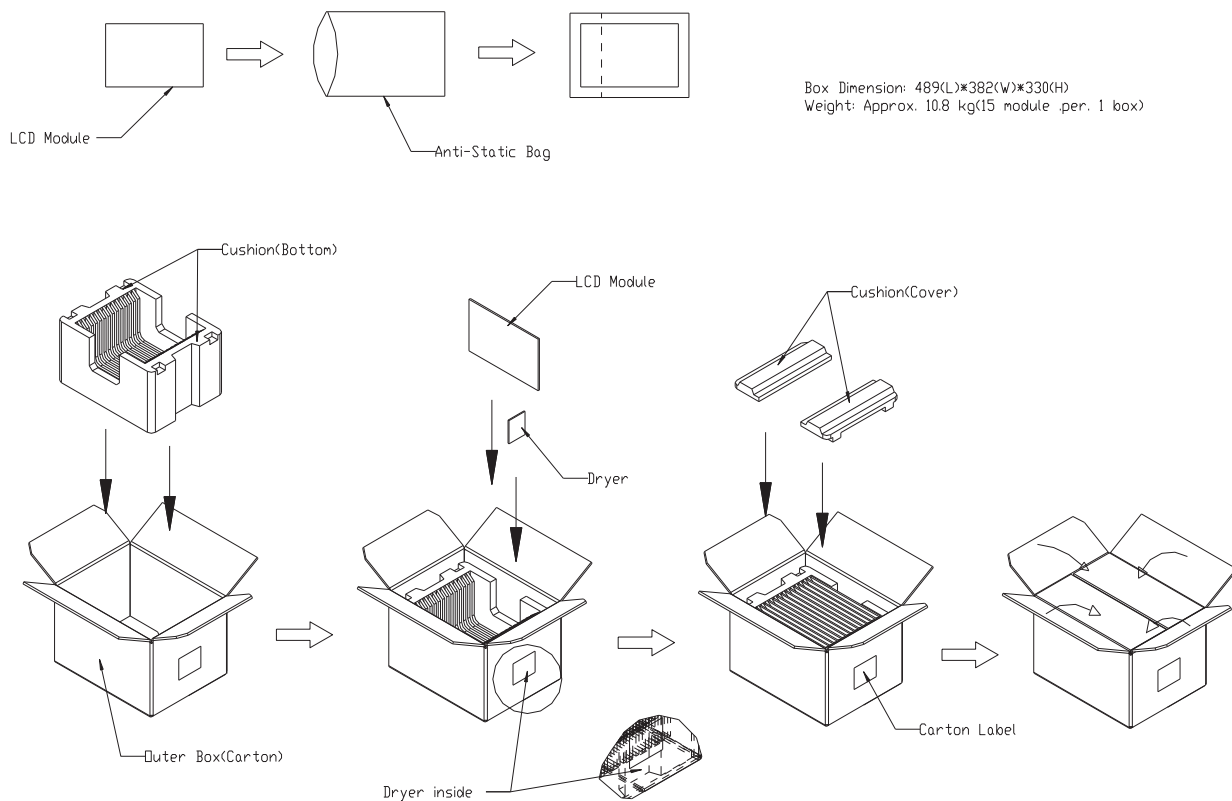
(1) Packing drop : 1 corner, 3 edges, 6 faces, each direction for one time, follow ISTA standard.

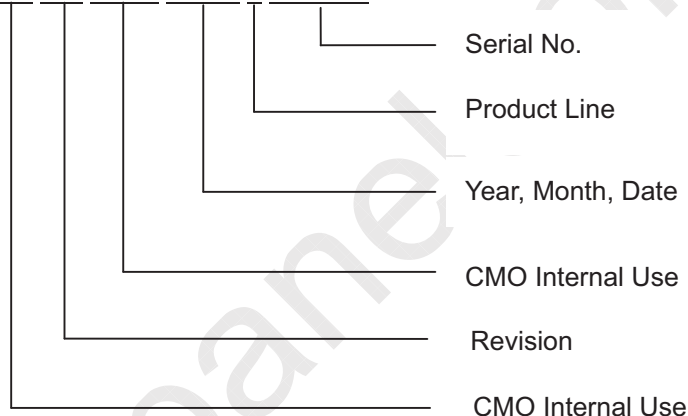(2) Packing vibration : Random, follow ISTA standard.

27 / 31

Version 3.0

14076426

Doc No.:
Issued Date: Jun. 04, 2007
Model No.: N154I2-L02 (NF4I202908)

Approval

9.2 PALLET

NOTES:
 Pallet:L1180*W1000*H145mm
 Pallet Stock Dim:L1180*W1000*H1465mm
 Weight:Approx. 286 kg

PE Sheet

Corner Protector
(50*50*1130 mm)

Film

Corner Protector
(50*50*1250 mm)

Pallet

PP Belt

CMO Carton Label

28 / 31

Version 3.0

Doc No.:
Issued Date: Jun. 04, 2007
Model No.: N154I2-L02 (NF4I202908)

Approval

10. DEFINITION OF LABELS

10.1 CMO MODULE LABEL

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.
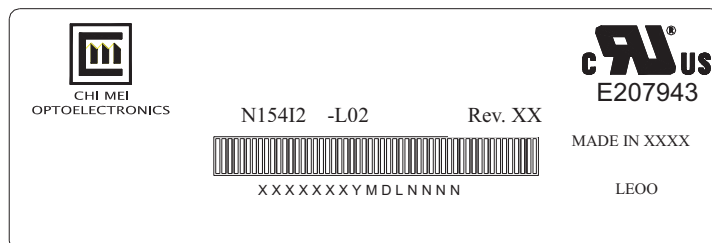
(a) Model Name: N154I2 - L02

(b) Revision: Rev. XX, for example: C1, C2 …etc.

(c) Production Location: MADE IN XXXX. XXXX stands for production location.

(d) UL logo: LEOO especially stands for panel manufactured by CMO NingBo satisfying UL requirement.
   The panel without LEOO mark stands for manufactured by CMO Taiwan satisfying UL requirement.

(e) Serial ID: X X X X X X X Y M D L N N N N

   Serial No.

   Product Line

   Year, Month, Date

   CMO Internal Use

   Revision

   CMO Internal Use

Serial ID includes the information as below:

(a) Manufactured Date: Year: 1~9, for 2001~2009

   Month: 1~9, A~C, for Jan. ~ Dec.

   Day: 1~9, A~Y, for 1st to 31st, exclude I , O and U

(b) Revision Code: cover all the change

(c) Serial No.: Manufacturing sequence of product

(d) Product Line: 1 -> Line1, 2 -> Line 2, …etc.

Version 3.0

14076426

Doc No.:
Issued Date: Jun. 04, 2007
Model No.: N154I2-L02 (NF4I202908)

Approval

10.2 CARTON LABEL

(a) Production location: Made In XXXX. XXXX stands for production location.

Version 3.0